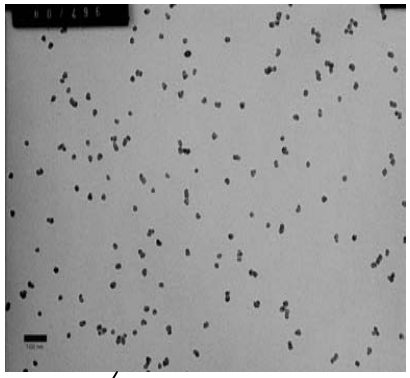
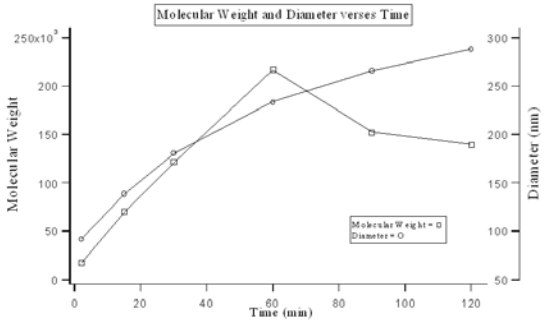
Direct Synthesis of Polymer Brushes Using Organometallic Catalysts with Tethered Initiators

Thomas A. P. Seery, University of Connecticut, DMR-9876244

Nanocomposites are touted as the "wave of the future" for applications where hybrid organic/inorganic materials are called for. These species present new challenges in characterization so that structure function correlations can be drawn. The aim of out project is to prepare tethered polymer layers using metal mediated polymerizations resulting in polymer brushes where all parameters may be determined *a priori.*

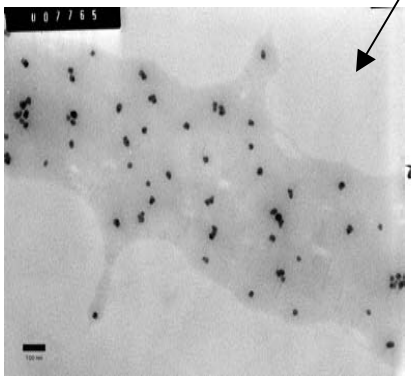
Polynorbornene/silica nanocomposites have been prepared using Stöber silica particles that have been functionalized with tethered ruthenium alkylidenes. The chemical and physical nature of these nanoparticles have been characterized at every stage of their preparation.

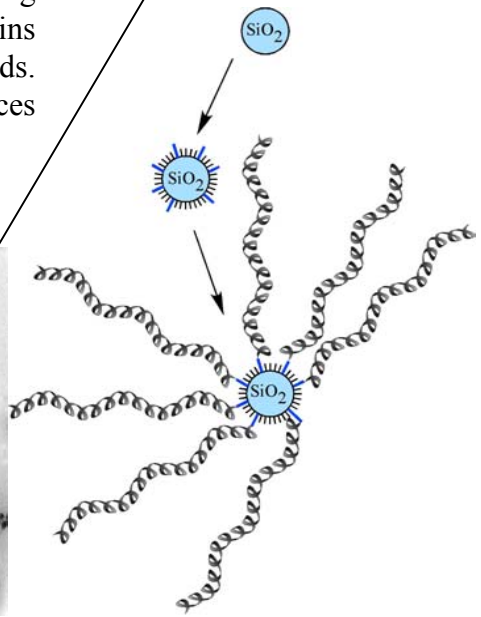




The nanocomposites can be observed using TEM during their synthesis and the grafted chains form a continuous phase when cast on TEM grids. These brushes can be cleaved from the surfaces using HF treatment to dissolve the silica core.

The freed chains show the expected growth in molecular weight the early stages of polymerization accompanied by the increasing diameter of the composites as followed by dynamic light scattering. The later stage decrease in chain molecular weight is likely due to backbiting reactions that are currently under investigation.





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Education:

This grant has supported the PhD research of two students: Mark Jordi (recently graduated and currently of Jordi Associates) and Rose Guino (3rd year); two post-doctoral scientists have been partially supported as well: Dr Catherine Fu (Magellan) and Dongqi Qin (Oklahoma State) ; several undergraduate students have also been supported: Mr. Daniel Sandberg and Ms. Kristen McBreairty, Ms. Eleanor Saito.

Outreach:

Several school year mentoring opportunities have grown out of the grant activities. Graduate students have worked with undergraduate mentors who in turn have taken on responsibility for mentoring high school interns. These actvities have also dovetailed with an active REU program culminating in our recent poster session: